

nigricella, *fuscicellula*, and *lutipennella* occur in Britain as well as *hemerobiella*, which though differing so much in appearance from the others is, I believe, connected with this group. They all have only three pairs of ventrals and all agree in making a somewhat peculiar first case and a second more simple case.

The group of white species whose larvæ spin their cases out of their own silk without admixture of vegetable matter is from the proleg point of view an especially interesting one. The largest species which spins a more complicated case than the others has three pairs of ventrals and there is no trace at all of the fourth pair. This is *palliatella*. In *anatipennella* and Stainton's *ibipennella* there are also only three pairs, but the ventral surface of the sixth abdominal segment, instead of being quite smooth as in *palliatella*, is marked by two scars lying in the situations which would have been occupied by the fourth pair of prolegs had they been present. From this it may be gathered that these two species have lost the fourth pair at a later period. In another group we have *ribicella*, this also has but three pairs of active ventrals, but it still carries the remnants of the fourth pair in the shape of two minute points on the sixth abdominal segment. It is one step behind *anatipennella* in the process of reduction. Among the three-paired species I think we may include *conspicuellula*. The first observer to notice the absence of prolegs on the sixth abdominal was the faithful artist who drew the figures of the larvæ of *limosipennella* and *conspicuellula* in Stainton's *Natural History of the Tineina* (vol. iv., pl. II., fig. 2a, and vol. v., pl. IX., fig. 2a), as both these larvæ are there shown with only three pairs. It is now many years ago since I first noticed these figures, but I believe the sight of them first induced me to examine the prolegs of Coleophorid larvæ.

In considering the loss of the fourth pair of prolegs, as we find four-paired larvæ within the genus, we need not go outside this but from the fact that the allied families, Gracilariides and Lithocolletides, have also lost the same pair, we may argue that there exists a tendency to lose this pair in the group of families forming this particular branch of the stirps. I have already described the arched position assumed by the larva when taken from its case, and I believe it retains this position as far as it is able to do so when carrying its case, that is to say, that the anal claspers are bent slightly under the body in contact with the floor of the case, while the dorsal parts of the abdominal segments are pressed against the roof of the case. The first two or three pairs of ventrals would be, owing to the confined space afforded by the case, also in contact with the floor, but owing to the incurved anal claspers, the fourth pair may be held above the floor. If this be so then it follows that the fourth pair will be less used than the other pairs, and it may follow that from disuse it gradually dwindles away till it is finally lost. This last condition has only been reached by certain species.

(To be continued.)

Seasonal Polymorphism and Races of some European Grypocera and Rhopalocera.

By ROGER VERITY, M.D.

(Continued from page 73.)

Leptosia sinapis, L.—This species produces on the eastern coast of the Adriatic a remarkable race, which by its gigantic size and other

features resembles some of the Asiatic ones, both in the summer *major*, Grund, and in the spring *croatica*, Grund; I have figured and discussed at length these interesting forms in *Rhopal. Palaeartica* (pp. 202 and 343) and described an intermediate race from the south of Russia under the name of *majorides* (p. 344). Series from various localities in Austria, sent by C. Höfer, are striking by the shape of their wings, when compared with the more western races, and evidently point to the very acuminate and even slightly falcate *croatica*, because the difference in length between the radial and the anal nervures is greater and the termen is less convex. This Austrian race is well worth distinguishing by the name of *acuta*. Apart from these, all the European races of the species are characterised, to my knowledge, from Scandinavia and England to Sicily and Andalusia, simply by their size or by grades in the extent of the dark pattern along one single line of variation. Features identical with the geographical ones also produce seasonal polymorphism. This is all exactly as in *Rumicia phlaeas*, L. (see *Ent. Rec.*, xxxii., p. 5), and the same law is followed by the two species in that they return to a form common to all regions in the first generation, whilst the local racial characteristic is usually and principally exhibited by the second generation. Various grades in the extent of the dark pattern have been described and fixed by names. I will first mention them and I will then endeavour to summarise briefly what I know of their distribution, as a first attempt to define the seasonal and racial variation of *sinapis*, so widespread and abundant and yet so neglected by entomologists and so vaguely known. Beginning by the lesser extent of dark pattern, we have:—

Grade I.: *deserticola*, Vrty., *Rhopal. Pal.*, p. 202 (November, 1908); small size, frail build, wings rather narrower than in most *sinapis* and with no other dark markings on either surface but a very reduced apical spot above, placed quite at a distance from the margins, dark grey rather than black, as a rule, and always shading into the white ground-colour all round. This form constitutes the race of Beyrouth in Syria, whence came my "type," entirely. It is however found also in the extreme south of Europe, evidently in the most hot and dry localities, as shown by the two specimens in my possession collected by C. Ribbe in the Sierra de Alfacar in Andalusia; the one I have figured in *Rhop. Pal.*, pl. xxxix., fig. 36, is absolutely identical with my Syrian "type." Whether *deserticola* may in some European localities constitute a race, as in Syria, I do not know; from Italy I have never seen a well characterised specimen. The third generation is the only one likely to produce it.

Grade II.: *diniensis*, Boisd.; usually a little larger and more robust than the preceding; there always is a light grey shading at the base of forewing on the underside, but none above; the apical spot is considerably darker and larger than in *deserticola*, but its outline shades into the white and it just falls short of reaching the margin, all round; it is usually more or less round in shape. I have observed a form, which one can consider collateral to this grade, because it has, like it, only one black spot at apex above, but here the spot is considerably more extensive and distinctly quadrangular in shape, reaching both margins; my "types" of the second generation (June), from the Pian di Mugnone, m. 200, near Florence, are also notably larger (mm. 37 to 40 in male and to 42 in female, between the ends of the fifth

radial nervures) than the average size of the species (mm. 34 to 38); on this account I call it *GRANDIS*.

Grade III. : *bivittata*, Vrty., *Ent. Rec.*, 1916, p. 98, with pattern above as in grade II., but with the grey suffusion at the base of forewing also on upperside; the apical patch is never as reduced in extent as it sometimes is in that grade; two sharply defined, though narrow, dark streaks across the underside of hindwing. This grade too has a collateral variation consisting in a greater wing-surface, due to broader wings and more convex margins, which make it appear considerably larger, although the expanse is not as much more as one would expect it from the look of the insect. My "types" of *bivittata* are of the second generation, from Mt. Conca, m. 400, above Fontebuona di Vaglia, a cold and damp locality, although not many miles away from the blazing hot Pian di Mugnone, where *grandis* is produced. The large form of grade III., just described, I propose calling *MAGNA*, taking as "typical" a little series of the second generation collected by me at the Baths of Valdieri, m. 1375, in the Maritime Alps; in this locality *sinapis*, like *P. napi*, actually succeeds in producing a second generation at the end of July, when *lathyr*i laggards of the first are still surviving, and a third at the end of August; the latter consists in form *bivittata*, with a few *diniensis*, all strikingly smaller than the second generation. I expect this may be the rule in most Alpine localities, because I have found it in S. Tyrol wherever I have collected. It is interesting to record that the second brood collected by Querci on the Coast Range of Calabria at 900 m., is perfectly identical with the Valdieri one, thus differing, as noted in several species, from the other races of Peninsular Italy, and resembling the Alpine one. Occasionally and more or less frequently, according to localities, one meets amongst the *magna* with individuals exhibiting very slight or no traces of dark pattern on underside of hindwing; they differ, notwithstanding, from *grandis*, by their expanse never being so large, by the broader and convex wing noted in *magna*, by the presence of the gray suffusion at base, by the apical patch above not being quadrangular nor nearly as extensive as in *grandis*, although it is usually a little more so in the second brood, and consequently in *magna*, than in the third one. This individual form, combining the features of *magna* and those of *diniensis*, I should deem it useful to designate by the name of *MAGNA-DINIENSIS*. In the same way the minority of *grandis* which have the dark streaks of *bivittata* on underside might well be called *GRANDIS-BIVITTATA*. A record of their percentage in the different localities and years will be interesting.

Grade IV. : *transiens*, Vrty., *Ent. Rec.*, 1916, p. 98, similar in size, shape, and upperside pattern to *bivittata*, but on underside of hindwing the two dark streaks are more broad, diffused, and shadowed in outline, and the latter gives out projections along the nervures which often connect the two streaks; a cloud of a lighter gray, because it consists of more sparse dark scales, is seen in some individuals between the streaks and along the dorsal margin; the ground colour is, on an average, of a brighter yellow than in the preceding grades; the underside thus approaches *lathyr*i more or less considerably, whereas the upperside has distinct summer features. I pointed out in my original description that the English summer brood generally consists of this

form, and my "types" are, in fact, July specimens of the New Forest. Series of the second generation of Central Europe, as far north as Chantonny in Vendée, I possess, are chiefly composed of *bivittata*, with an occasional *diniensis*. The third brood of the damper localities of Central Italy, such as the one near Florence mentioned above, which produces my typical *bivittata* in the second brood, or such as Poggio, m. 400, in the Isle of Elba, exhibit in the majority of individuals *transiens* perfectly similar to the English second generation. An interesting series of third brood was collected by the Quercis from the end of August to the middle of September, 1921, in the Mainarde Mts., at Atina, m. 500; it exhibits at first a majority of *bivittata*, then, as the season goes on, *transiens* supersedes it entirely and becomes more and more like *lathyri*, till at the end of the emergence two *lathyri* were found, quite similar to the spring form.

Grade V.: *lathyri*, Hübner, is the first generation of all the localities of the species, except those very special ones where the following extreme one replaces it, and it is so well known that I need not describe it here in detail. Its individual variation is far greater than that of the other broods, but all the series I possess from several latitudes and altitudes seem alike on an average, except for size, and the lighter or deeper tone of gray of apical patch; the one from Waidbruck in S. Tyrol is, on the whole, the largest; the Florence series is the smallest, although, curiously enough, it is the one which produces the remarkably large *grandis* in the second generation; the third generation from this locality is, however, again a particularly small *diniensis*. These marked seasonal differences in size can be explained by a knowledge of the surroundings: there are no springs of water in the Pian di Mugnone, but during the spring months the ground becomes very swampy, when it is on a level, on account of the winter and spring rains; the vegetation then becomes very luxuriant in the hot days of the end of spring. There then follows the summer drought, when the ground becomes baked and vegetation extremely scanty, and this produces the small *diniensis*. Autumn rains bring out a fresh crop of grasses, but evidently not sufficient for the larvæ of *lathyri*, which are then feeding, to grow large.

Grade VI.: *nigrescens*, Vrty., *Ent. Rec.*, 1919, p. 87, can be described as the highest expression of the *lathyri* features, more accentuated than they are in the vast majority of cases. The basal suffusion is distinctly blackish instead of gray on both surfaces; it fills the cell and extends far beyond it on forewing above; it also exists at the back of cell, along the dorsal margin; the apical patch is very broad and stretches backwardly by a tapering point as far as the first cubital nervure; both the cubital nervures have a black streak at their ends; the aforesaid patch is always black, as it often is in northern races, but only exceptionally in the usual races of Central Italy, such as *grandis*, which might well be called *cana* in the first brood by its very pale gray tinge, evidently due to the same causes as the crescent of that tinge so often produced in the *Pieris* of this region; also the underside of *nigrescens* is more extensively darkened and of a colder tone. This race I discovered at the mouth of the Arno on such swampy grounds that they are under one or two feet of water after the winter and spring rains; in the last days of May the water had just retired and male *sinapis* was beginning to emerge, whereas in the

plains of Tuscany it is quite over by that time; it makes one wonder whether the chrysalids of *nigrescens* get submerged.

I must mention the name of *sartha*, Rühl. (*Pal. Gross-Schmett.*, p. 143), a large form described from "the south of Europe and Asia Minor," but I am quite unable to refer the characters he gives to any form of *sinapis* I know, especially as regards "the underside of hind-wings entirely yellowish-green, weakly sprinkled with dark." As to the form which should be the nymotypical one of *sinapis*, I have stated in other papers that the specimen left by Linnæus is a *lathyri*, Hb. I understand most entomologists are inclined to disregard specimens. In that case the data of literature alone work out as follows: Linnæus's description applies to any *Leptosia*: his only quotation is *Fauna Svecica* and no habitat is mentioned; the Scandinavian race is thus nymotypical. Hübner was at liberty to name any form he chose, and by calling the first brood *lathyri* he restricted *sinapis* to the summer one. I have designated two more grades of variation by the names of *bivittata* and *transiens*. That of nymotypical *sinapis* is thus restricted to individual forms standing between these two, and such as would, in fact, I presume, be most numerous in the second generation of Scandinavia. Form *transiens* and spring-like *lathyri* probably outnumber them in damper localities, but I doubt *bivittata* being more than exceptional even in the hottest summers. In Central Europe the latter seems, on the contrary, to predominate, with fluctuations towards *transiens* or towards *diniensis*. We thus have:—

In Northern Europe: Race *lathyri*, Hb., with only one generation. Races *transiens*, Vrty., and *sinapis*, L., with *lathyri* as first generation.

In Central Europe: Races *diniensis*, *bivittata*, *magna*, *sinapis*, and *transiens*, all with *lathyri* as first generation; a third generation certainly exists in the southern portion.

In Southern Europe: Race *deserticola*, Vrty., may occur locally in the extreme south. The following have been found in Italy:—Race *DINIENSIS*, B.: I. gen. *cana*, Vrty., or *lathyri*, Hb.; II. and III. gen. *diniensis*. Race *GRANDIS*, Vrty.: I. gen. *cana*, Vrty.; II. gen. *grandis*; III. gen. *diniensis*. Race *BIVITTATA*, Vrty.: I. gen. *lathyri*; II. gen. *bivittata*; III. gen. *transiens*, Vrty. Race *MAGNA*, Vrty.: I. gen. *lathyri*; II. gen. *magna*; III. gen. *diniensis*. Race *NIGRESCENS*, Vrty.: I. gen. *nigrescens*; II. and III. gen. unknown. There remains to establish the distribution of these races; to my present knowledge, it is, on broad lines, as follows: race *diniensis* is by far the most usual and widespread, at all altitudes, in Peninsular Italy; it is probably very frequent in dry localities of Northern Italy; *grandis* may be found to be peculiar to Central Italy; it is produced in hot localities, where the spring vegetation is particularly luxuriant; *bivittata* is presumably the most widespread in Northern Italy; in Central Italy it is found in damp localities; *magna* is the race of the Alps, where the vegetation is luxuriant in the early summer, and of the Coast Range of Calabria; *nigrescens* is the marsh race. No fourth generation, or even emergence of sporadic individuals, of *L. sinapis* has ever been observed anywhere as far as I know.

(To be concluded.)